IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1-9. (Canceled)

10. (Currently Amended) A starting-process controller for starting a piezomotor, comprising:

[[-]] a voltage-controlled oscillator (VCO), a power output stage, a resonance converter, a phase comparator, a phase-locked loop filter and an adjustable time-delay element, wherein

[[-]] the VCO generates the control signals required for the power output stage,

[[-]] the power output stage provides stepped output voltage,

[[-]] the resonance converter converts the stepped output voltage from the power output stage into a motor voltage for driving the piezomotor, the motor voltage being sinusoidal and

having an associated motor current when the piezomotor is driven,

[[-]] the phase comparator compares the motor current with the phase of the motor voltage, and provides a phase-difference signal representing a measure of the phase difference between motor current and the motor voltage,

[[-]] the phase-locked loop filter is configured to smooth the phase-difference signal so as to provide a smoothed signal that controls the VCO, and

[[-]] the adjustable time-delay element providing for controlled reduction of the phase difference between the motor voltage and the motor current in a start-up process for starting up the piezomotor from a large starting angle at initiation of the start-up process towards a smaller operating angle at an operating point, the adjustable time-delay element effecting the reduction in the form of one of: (i) a preset linear gradient, the linear gradient having a preset starting delay, a preset final delay and a preset, fixed change in delay per selected time increment over the duration of the start-up process, such that, at initiation of the start-up process, the starting delay applies to generate a start-up phase angle toward enabling reliable start up of the piezomotor

and, at the operating point, the final delay applies to generate an operating phase angle toward enabling reliable operation of the piezomotor, or (ii) a preset progressive curve, the progressive curve having a preset starting delay, a preset final delay and a preset, varying change in delay per selected time increment over the duration of the start-up process, such that, at initiation of the start-up process, the starting delay applies to generate a start-up phase angle toward enabling reliable start up of the piezomotor, and, as the operating point is neared, the change in delay per selected time increment becomes progressively smaller and, at the operating point, the final delay applies to generate an operating phase angle toward enabling reliable operation of the piezomotor, or (iii) a preset combination of a linear gradient and a progressive curve, wherein an output of the adjustable time-delay element is directly connected to an input of the phase comparator.

Claim 11 (Canceled)

12. (Previously Presented) The starting-process controller of claim 10, wherein the adjustable time-delay element comprises a

digital counter, and wherein the digital counter effects the controlled reduction in phase angle between the motor voltage and the motor current in the form of the linear gradient, the progressive curve or the combination of such gradient and curve.

13. (Previously Presented) The starting-process controller of claim 12, wherein, at selected times during the start-up process, the digital counter has respective starting values such that the starting value of the digital counter at a particular selected time fixes the respective delay as to the motor current, the delay generating a phase angle at such selected time.

14. (Previously Presented) The starting-process controller of claim 13, wherein the digital counter counts from each starting value to a preset final count, the final count being associated with the passing on of the motor current subject to the respective delay.

15. (Previously Presented) The starting-process controller of claim 13, further comprising a start-up process delay controller,

the start-up process delay controller controlling the adjustable time-delay element by one or both of (i) providing the starting values to the digital counter of the adjustable time-delay element and/or (ii) having a timing interval associated with the selected time increment between changes in delay.

16. (Previously Presented) The starting-process controller of claim 10, further comprising a start-up process delay controller, the start-up process delay controller controlling the adjustable time-delay element by one or both of (i) providing one or more of the starting delay, the final delay and/or the change in delay and/or (ii) having a timing interval associated with the selected time increment between changes in delay.

17. (Previously Presented) The starting-process controller of claim 16, wherein the start-up process delay controller comprises a reference counter that counts oscillations of a reference frequency, the reference frequency forming a clock signal of the reference counter.

18. (Previously Presented) The starting-process controller of claim 17, wherein the counts made by the reference counter are used directly for setting the delay.

19. (Previously Presented) The starting-process controller of claim 17, wherein the counts made by the reference counter are converted into a value for setting the delay.

20. (Previously Presented) The starting-process controller of claim 17, wherein the counts made by the reference counter are converted into settings for the delay by means of a table of a memory device.

21. (Previously Presented) The starting-process controller of claim 10, wherein the starting process is monitored by a programmable control device.

22. (Previously Presented) The starting-process controller of claim 21, wherein the programmable control device monitors the phase delay digitally.

23. (Canceled)

24. (Currently Amended) ~~The~~ A starting process controller ~~of claim 10~~ for starting a piezomotor, comprising:

a voltage-controlled oscillator (VCO), a power output stage, a resonance converter, a phase comparator, a phase-locked loop filter and an adjustable time-delay element, wherein

the VCO generates the control signals required for the power output stage,

the power output stage provides stepped output voltage,

the resonance converter converts the stepped output voltage from the power output stage into a motor voltage for driving the piezomotor, the motor voltage being sinusoidal and having an associated motor current when the piezomotor is driven,

the phase comparator compares the motor current with the phase of the motor voltage, and provides a phase-difference signal representing a measure of the phase difference between motor current and the motor voltage,

the phase-locked loop filter is configured to smooth the

phase-difference signal so as to provide a smoothed signal that controls the VCO, and

the adjustable time-delay element providing for controlled reduction of the phase difference between the motor voltage and the motor current in a start-up process for starting up the piezomotor from a large starting angle at initiation of the start-up process towards a smaller operating angle at an operating point, the adjustable time-delay element effecting the reduction in the form of one of: (i) a preset linear gradient, the linear gradient having a preset starting delay, a preset final delay and a preset, fixed change in delay per selected time increment over the duration of the start-up process, such that, at initiation of the start-up process, the starting delay applies to generate a start-up phase angle toward enabling reliable start up of the piezomotor and, at the operating point, the final delay applies to generate an operating phase angle toward enabling reliable operation of the piezomotor, or (ii) a preset progressive curve, the progressive curve having a preset starting delay, a preset final delay and a preset, varying change in delay per selected time increment over the duration of the start-up process, such that, at initiation of

the start-up process, the starting delay applies to generate a start-up phase angle toward enabling reliable start up of the piezomotor, and, as the operating point is neared, the change in delay per selected time increment becomes progressively smaller and, at the operating point, the final delay applies to generate an operating phase angle toward enabling reliable operation of the piezomotor, or (iii) a preset combination of a linear gradient and a progressive curve, wherein the adjustable time-delay element delays only one of the motor voltage and the motor current, and provides the delayed one of the motor voltage and the motor current to the input of the phase comparator.

25. (Currently Amended) ~~The~~ A starting-process controller ~~of claim 10~~ for starting a piezomotor, comprising:

a voltage-controlled oscillator (VCO), a power output stage, a resonance converter, a phase comparator, a phase-locked loop filter and an adjustable time-delay element, wherein

the VCO generates the control signals required for the power output stage,

the power output stage provides stepped output voltage,

the resonance converter converts the stepped output voltage from the power output stage into a motor voltage for driving the piezomotor, the motor voltage being sinusoidal and having an associated motor current when the piezomotor is driven,

the phase comparator compares the motor current with the phase of the motor voltage, and provides a phase-difference signal representing a measure of the phase difference between motor current and the motor voltage,

the phase-locked loop filter is configured to smooth the phase-difference signal so as to provide a smoothed signal that controls the VCO, and

the adjustable time-delay element providing for controlled reduction of the phase difference between the motor voltage and the motor current in a start-up process for starting up the piezomotor from a large starting angle at initiation of the start-up process towards a smaller operating angle at an operating point, the adjustable time-delay element effecting the reduction in the form of one of: (i) a preset linear gradient, the linear gradient having a preset starting delay, a preset final delay and a preset, fixed change in delay per selected time increment over the duration of

the start-up process, such that, at initiation of the start-up process, the starting delay applies to generate a start-up phase angle toward enabling reliable start up of the piezomotor and, at the operating point, the final delay applies to generate an operating phase angle toward enabling reliable operation of the piezomotor, or (ii) a preset progressive curve, the progressive curve having a preset starting delay, a preset final delay and a preset, varying change in delay per selected time increment over the duration of the start-up process, such that, at initiation of the start-up process, the starting delay applies to generate a start-up phase angle toward enabling reliable start up of the piezomotor, and, as the operating point is neared, the change in delay per selected time increment becomes progressively smaller and, at the operating point, the final delay applies to generate an operating phase angle toward enabling reliable operation of the piezomotor, or (iii) a preset combination of a linear gradient and a progressive curve, wherein the adjustable time-delay element includes a binary counter whose output is provided to the input of the phase comparator.

26. (Canceled)

27. (Previously Presented) The starting-process controller of claim 23, wherein during an initial start-up period of the piezomotor, the adjustable time-delay element is adapted to adjust the delay amount linearly from a preset start-up delay value to a preset final delay value, the adjustable time-delay element being further adapted to provide a preset, fixed change in the delay amount per selected time increment over a duration of the initial start-up period.

28. (Previously Presented) The starting-process controller of claim 27, wherein the adjustable time-delay element comprises:

a binary counter adapted to load a count value corresponding to the preset start-up delay value and to receive a clock signal corresponding to a frequency of the VCO, and to provide a counter output value that changes linearly at each cycle of the clock signal;

a programmable counter adapted to receive the motor current and to load the counter output value from the binary counter in

response to the motor current, and is further adapted to receive a clock signal, to count in response to the clock signal, and to output the delayed motor current; and

a comparator adapted to receive the counter output value and a value corresponding to the preset final delay value, to compare the counter output value to the preset final delay value, and to output a stop signal to the binary counter to disable further counting when the counter output value equals the preset final delay value.

29. (Previously Presented) The starting-process controller of claim 23, wherein during an initial start-up period of the piezomotor, the adjustable time-delay element is adapted to adjust the delay value along a progressive curve from a preset start-up delay value to a preset final delay value such that a change in the delay value per selected time increment is greater at a beginning of the initial start-up period and is less at an end of the initial start-up period.

30. (Previously Presented) The starting-process controller of claim 29, wherein the adjustable time-delay element comprises:

a binary counter adapted to load a count value corresponding to the preset start-up delay value and to receive a clock signal corresponding a frequency of the VCO, and to provide a counter output value that changes at each cycle of the clock signal;

a look-up table adapted to receive the count value from the binary counter and to an output a table value corresponding to the received count value, the look-up table being adapted to map the count value to the table value such that the delay is adjusted along the progressive curve from the preset start-up delay value to the preset final delay value such that the change in delay per selected time increment is greater at the beginning of the initial start-up period and is less at the end of the initial start-up period; and

a programmable counter adapted to receive the motor current and to load the output table value from the look-up table in response to the motor current, and is further adapted to receive a clock signal, to count in response to the clock signal, and to output the delayed motor current.